Europäisches Patentamt	European Patent Office	Office européen des brevets

01.07.03

Bescheinigung Certificate Attestation

Die angehefteten Unterlagen stimmen mit der ursprünglich eingereichten Fassung der auf dem nächsten Blatt bezeichneten europäischen Patentanmeldung überein.	The attached documents are exact copies of the European patent application described on the following page, as originally filed.	Les documents fixés à cette attestation sont conformes à la version initialement déposée de la demande de brevet européen spécifiée à la page suivante.

Patentanmeldung Nr.   Patent application No.   Demande de brevet n°

02077983.1

> **PRIORITY DOCUMENT**
> SUBMITTED OR TRANSMITTED IN
> COMPLIANCE WITH
> RULE 17.1(a) OR (b)

Der Präsident des Europäischen Patentamts;
Im Auftrag

For the President of the European Patent Office

Le Président de l'Office européen des brevets
p.o.

R C van Dijk

Anmeldung Nr:
Application no.:   02077983.1
Demande no:

Anmeldetag:
Date of filing: 22.07.02
Date de dépôt:

Anmelder/Applicant(s)/Demandeur(s):

Koninklijke Philips Electronics N.V.
Groenewoudseweg 1
5621 BA   Eindhoven
PAYS-BAS

Bezeichnung der Erfindung/Title of the invention/Titre de l'invention:
(Falls die Bezeichnung der Erfindung nicht angegeben ist, siehe Beschreibung.
If no title is shown please refer to the description.
Si aucun titre n'est indiqué se referer à la description.)

Determining type of signal encoder

In Anspruch genommene Priorität(en) / Priority(ies) claimed /Priorité(s)
revendiquée(s)
Staat/Tag/Aktenzeichen/State/Date/File no./Pays/Date/Numéro de dépôt:

Internationale Patentklassifikation/International Patent Classification/
Classification internationale des brevets:

H03M3/00

Am Anmeldetag benannte Vertragstaaten/Contracting states designated at date of
filing/Etats contractants désignées lors du dépôt:

AT BE BG CH CY CZ DE DK EE ES FI FR GB GR IE IT LI LU MC NL PT SE SK TR

2

Determining type of signal encoder

FIELD OF THE INVENTION

The invention relates to a method of determining whether an encoded signal has been encoded with a particular type of encoder. The invention also relates to a server station being arranged to carry out such a method.

5

BACKGROUND OF THE INVENTION

Numerous types of encoding algorithms are nowadays used to encode multimedia files. Well known compression formats are "zip" (for data), "mp3", "wma" (for audio), "avi" and "divx" (for movies). The respective encoder removes almost all

10   redundancy, and in case of lossy encoding also the irrelevancy, from the original signal so as to obtain an encoded signal that can more efficiently be stored and/or distributed.

Sometimes it is desired to determine by which type of encoder an encoded signal has been produced, or at least ascertain whether an encoded signal has been produced by a particular type of encoder. Computer file names have an extension (such as .zip, .mp3,

15   .avi) for that purpose. Some encoders also render identification possible by adding a header that reveal the necessary information to the contents. However, file name extensions and headers are sometimes missing or cannot be trusted.

Generally, the type of encoding cannot be identified by mere inspection of the encoded signal, because the encoded and compressed contents contains little or no structure.

20   A trivial solution would be to try all possible decoders and interpret their outputs. For audio signals, a human being would have to listen whether the decoder output is music or not. This may be hard decision for some types of music. Moreover, such a solution requires human interaction, and cannot be automated.

25   OBJECT AND SUMMARY OF THE INVENTION

It is an object of the invention to provide an alternative method and arrangement for determining whether an encoded signal has been encoded with a particular type of encoder.

These and other objects are achieved with the method in accordance with the invention, which method comprises the steps of: receiving at least a part of said encoded signal; decoding the received signal using a decoder which performs the reverse operation of said particular type of encoder; deriving a fingerprint from the decoded signal; comparing said fingerprint with fingerprints stored in a database; and concluding that the encoded signal has been encoded with said particular type of encoder if the derived fingerprint corresponds to one of the fingerprints stored in the database.

The invention exploits the insight that the structure of encoded material is meaningless to a decoder which is not complementary to the respective encoder. Contents being decoded by the wrong decoder differs significantly from the original contents. It is even unlikely that music or video being reproduced by a wrong decoder resembles any other existing original material. Fingerprints are binary sequences that identify robust perceptual features of contents. If two signals are similar, their respective fingerprints are also similar. If two signals are perceptually different, the respective fingerprints are also different. This property of fingerprints is used by the method in accordance with the invention to determine whether the decoded signal is an original one.

An advantageous application of this method is promotion of a particular signal encoder. In order to promote its "xxx" signal encoding algorithm, company X offers owners of its xxx-encoder the possibility to upload (parts of) their .xxx files to the company's website. Using the method according to the invention, the company's web-server checks whether the received file is indeed xxx-encoded material and in the affirmative case awards the owner. A possible award is the transmission, to the user, of metadata associated with the signal such as title, artist, lyrics, etc.

BRIEF DESCRIPTION OF THE DRAWINGS

These and other aspects of the invention will be apparent from and elucidated with reference to the embodiment shown in the drawings, in which:

Fig. 1 shows a schematic diagram of a system to illustrate the operation of the method in accordance with the invention.

DESCRIPTION OF EMBODIMENTS

The invention will be explained with reference to audio signals, but it will be appreciated that the invention is not limited thereto and can equally be applied to video and other type of multimedia signals. Fig. 1 shows a schematic diagram of a system to illustrate

the operation of the method in accordance with the invention. The system comprises a server 1 and a client 2 connected together through a network 3.

The client 2, which may in practice take the form of a personal computer, comprises an audio encoder 21 and a return channel input unit 22. The audio encoder may be

5   a software program being downloaded from the server 1. A piece of music 4 being applied to the client is encoded by audio encoder 21. The encoded audio signal is subsequently uploaded to the server 1 through the network.

The server 1 comprises an audio decoder 11, a fingerprint extraction unit 12, a processor 13, and a database 14. In the server, the music song being uploaded by the client is

10   decoded by the audio decoder 11. If the encoder 21 being used by the client matches the server's decoder 11, then the decoded signal will be the same as, or at least perceptually resemble, the original piece of music 4. Otherwise, the decoded audio signal will be an undefined creaky noisy sound, because the encoded signal has a structure which is meaningless to a decoder which has not been designed to be the complement of encoder 11.

15   The decoded audio signal is applied to the fingerprint extraction unit 12. A fingerprint is a bit pattern indicative of robust perceptual features of the audio signal. If two audio signals are perceptually very similar, the respective fingerprints are also similar (but not necessarily identical). A practical embodiment of the fingerprint extraction unit 12 that can be used in the system is described in Jaap Haitsma, Ton Kalker and Job Oostveen,

20   "Robust Audio Hashing for Content Identification", CBMI 2001, Brescia, Italy. For video applications, a practical embodiment is described in Job Oostveen, Ton Kalker and Jaap Haitsma, "Visual Hashing of Digital Video: Applications and Techniques", SPIE, Applications of Digital Image Processing XXIV, July 31 - August 3 2001, San Diego, USA.

The fingerprint extracted from the decoded audio signal is searched in the

25   database 14 by the processor 13. In the database, one or more fingerprints are stored, that have previously been extracted from respective original audio signals. If the extracted fingerprint matches one of the fingerprints stored in the database, then the decoder 11 has apparently indeed decoded an original piece of music. In that case, the processor concludes that encoder 21 of client 2 is indeed the counterpart of the server's decoder 11. An

30   appropriate message is then sent to the client.

If the extracted fingerprint is not found in the database, then either the encoder 21 being used by the client is not the counterpart of decoder 11, or the uploaded piece of music 4 is not stored in the server's database. In the latter case, the server may transmit a

message to the client requesting him to upload a particular song or one from a plurality of particular songs.

In a practical embodiment of server **1**, the decoding **11**, fingerprint extraction **12**, and database searching are all performed by the processor **13**, which to that end is loaded

5   with an appropriate computer program.

A novel application of this invention is promotion of a particular signal encoder. A company may encourage the public to buy its encoder by awarding the owner for uploading a piece of encoded material to its website. After identifying the origin of the uploaded signal as being encoded by the preferred encoder, the owner can be given rights to

10   access particular information or execute particular processes.

The invention can be summarzied as follows. In order to promote its "xxx" signal encoding algorithm, company X offers users of a particular encoder (21) the possibility to upload (parts of) their .xxx files to the company's website. The company's web-server (1) checks whether the received file is indeed xxx-encoded material by (i) decoding the file using

15   an xxx-decoder (11), (ii) deriving a fingerprint (12) from the decoded signal, and (iii) awarding the owner if the derived fingerprint corresponds to one of the fingerprints stored in X's database (14). A possible award is the transmission, to the user, of metadata associated with the signal such as title, artist, lyrics, etc.

CLAIMS:

1.   A method of determining whether an encoded signal (4) has been encoded
with a particular type of encoder (21), comprising the steps of:
-   receiving at least a part of said encoded signal;
-   decoding (11) the received signal using a decoder which performs the reverse operation
5   of said particular type of encoder;
-   deriving a fingerprint (12) from the decoded signal;
-   comparing (13) said fingerprint with fingerprints stored in a database (14); and
-   concluding that the encoded signal has been encoded with said particular type of encoder
    if the derived fingerprint corresponds to one of the fingerprints stored in the database.

10

2.   A method as claimed in claim 1, wherein said steps are performed by a server
(1) which receives the encoded signal from a client (2) through a network (3).

3.   A method as claimed in claim 2, further comprising the step of awarding (22)
15   the client if the server concluded that the received encoded signal has been encoded with said
particular type of encoder.

4.   A method as claimed in claim 3, wherein said step of awarding comprises
retrieving from the database metadata associated with the signal, and transmitting said
20   metadata to the client.

5.   A server station (1) connected to a network (3) for receiving encoded signals
from a client (2), the server station comprising:
-   a database (14) for storing one or more fingerprints identifying respective multimedia
25   signals (4);
-   a decoder (11) for decoding an encoded signal received from said client, the decoder
    performing the reverse operation of a particular type of encoder (21);
-   means (12) for deriving a fingerprint from the decoded signal;

– processing means (13) for comparing said fingerprint derived from the decoded signal with fingerprints stored in said database, and concluding that the received encoded signal has been encoded with said particular type of encoder if the derived fingerprint corresponds to one of the fingerprints stored in the database.

5   6.   A server station as claimed in claim 5, further comprising means for awarding the client if the server concludes that the received encoded signal has been encoded with said particular type of encoder.

7.   A server station as claimed in claim 6, wherein said awarding comprises
10   retrieving from the database metadata associated with the signal, and transmitting said metadata to the client.

8.   A computer program product for instructing a processor (13) to carry out the method as claimed in any of claims 1-4.

ABSTRACT:

In order to promote its "xxx" signal encoding algorithm, company X offers users of a particular encoder (21) the possibility to upload (parts of) their .xxx files to the company's website. The company's web-server (1) checks whether the received file is indeed xxx-encoded material by (i) decoding the file using an xxx-decoder (11), (ii) deriving a fingerprint (12) from the decoded signal, and (iii) awarding the owner if the derived fingerprint corresponds to one of the fingerprints stored in X's database (14). A possible award is the transmission, to the user, of metadata associated with the signal such as title, artist, lyrics, etc.
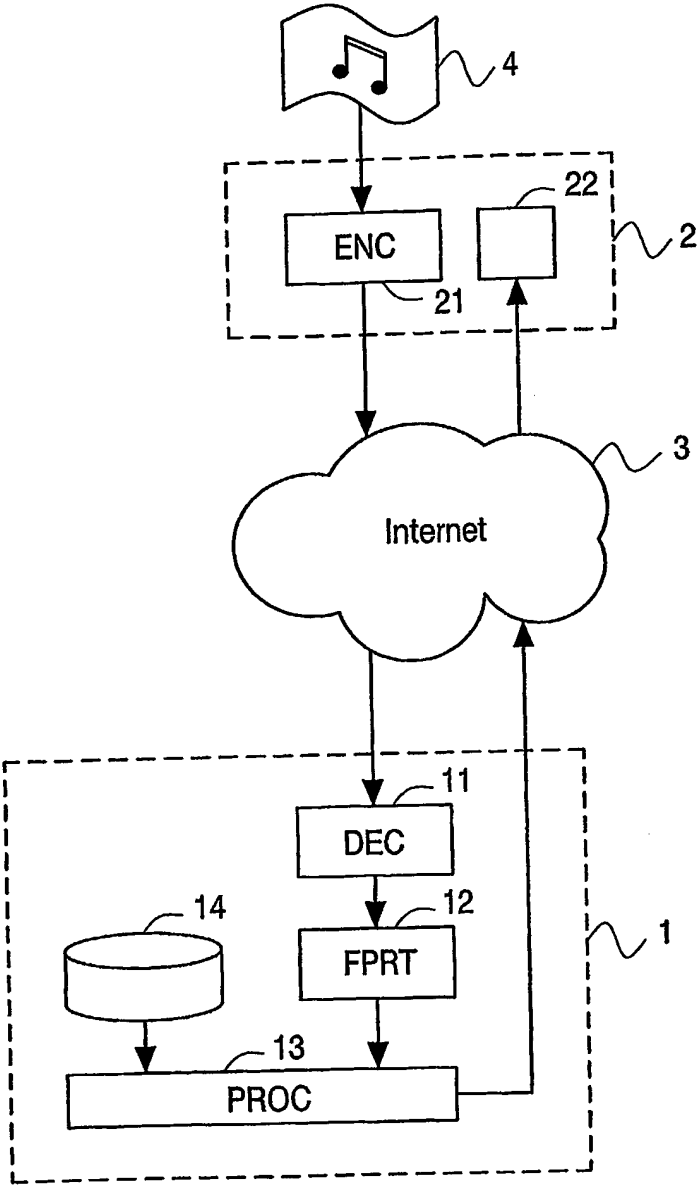
10   Fig. 1

Fig.1